

Sept. 21, 1965

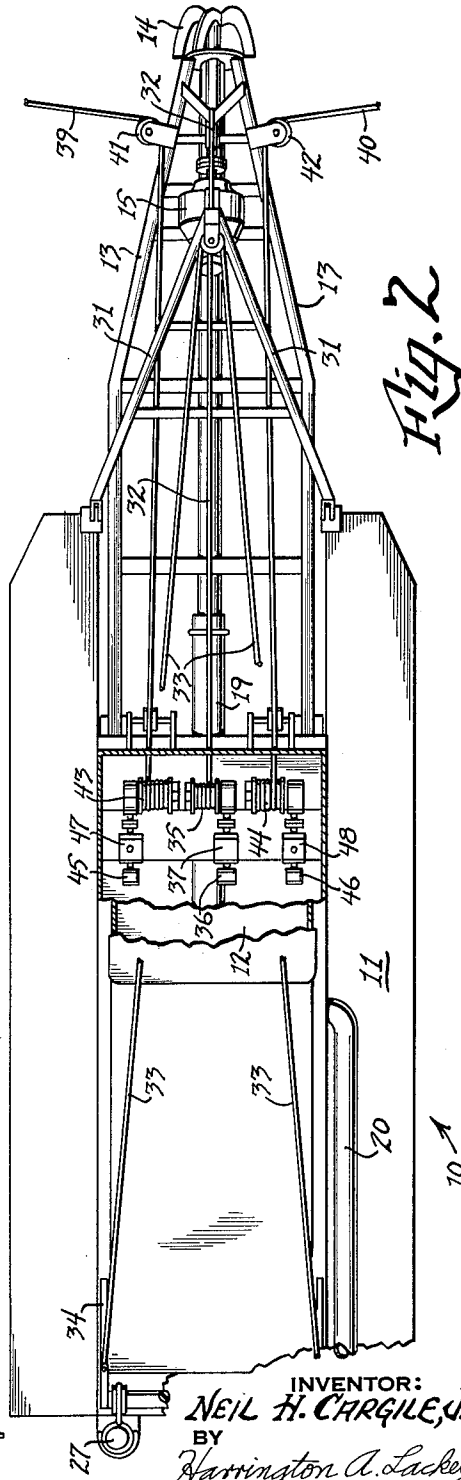
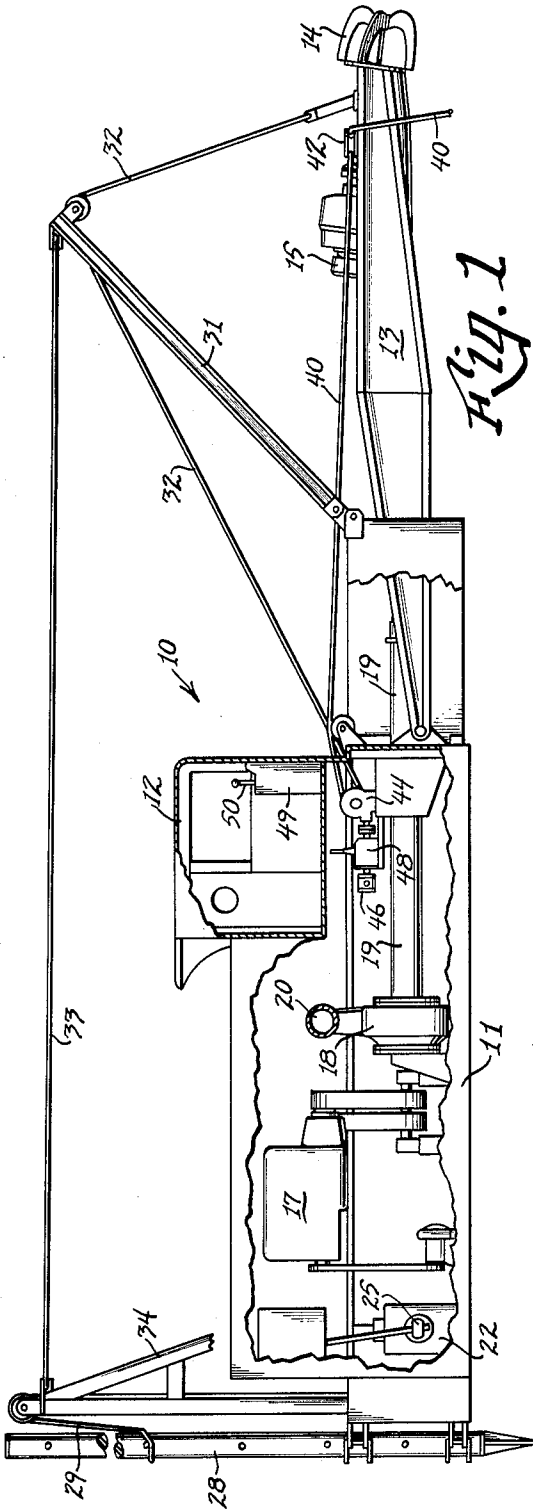
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3,206,875

HYDRAULIC DRIVE MEANS FOR DREDGE COMPRISING MEANS
FOR THE SELECTIVE INJECTION OR WITHDRAWAL OF
PRESSURE FLUID FROM A MOTOR
DRIVING CIRCUIT

Filed July 12, 1962

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

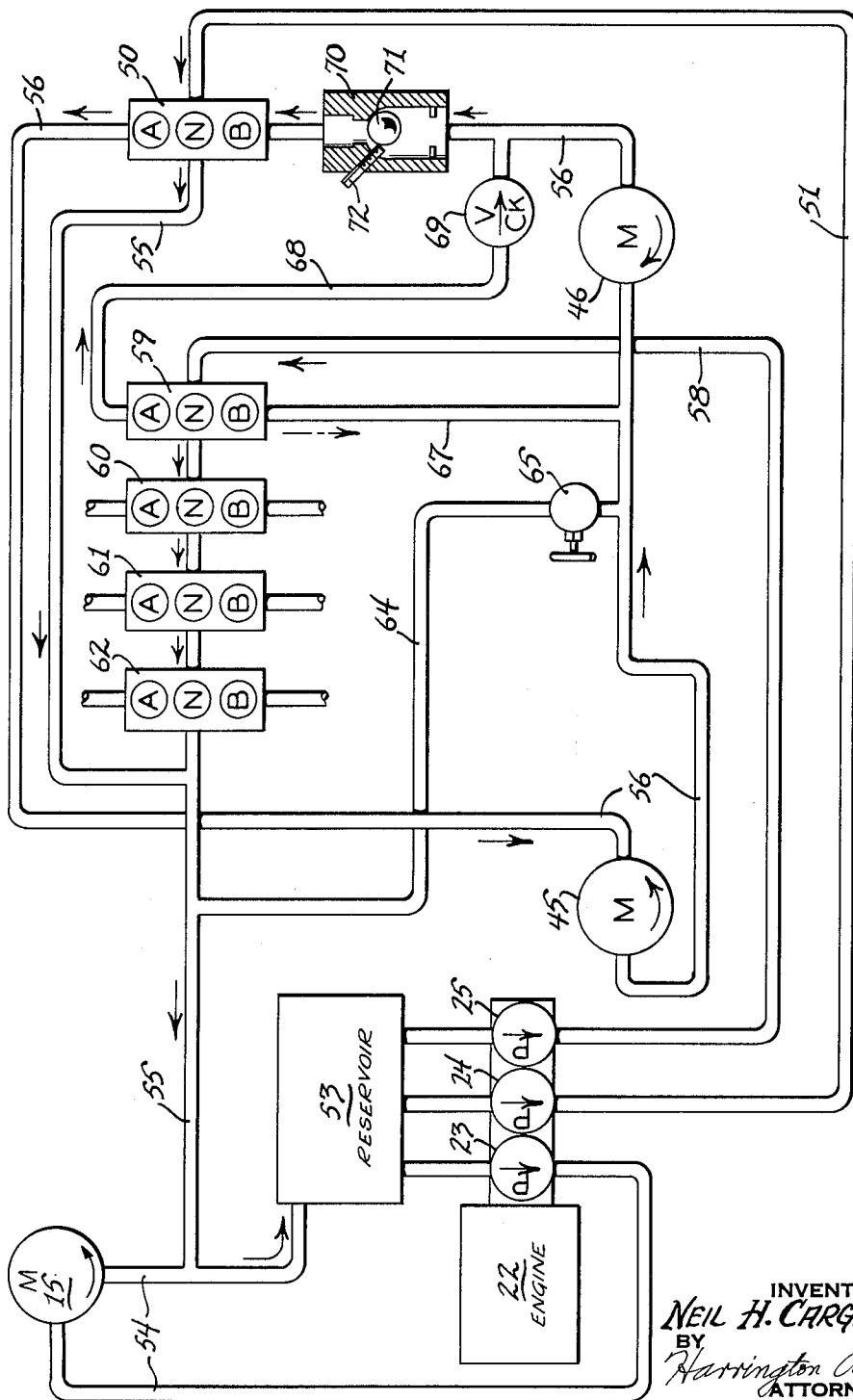


Fig. 3

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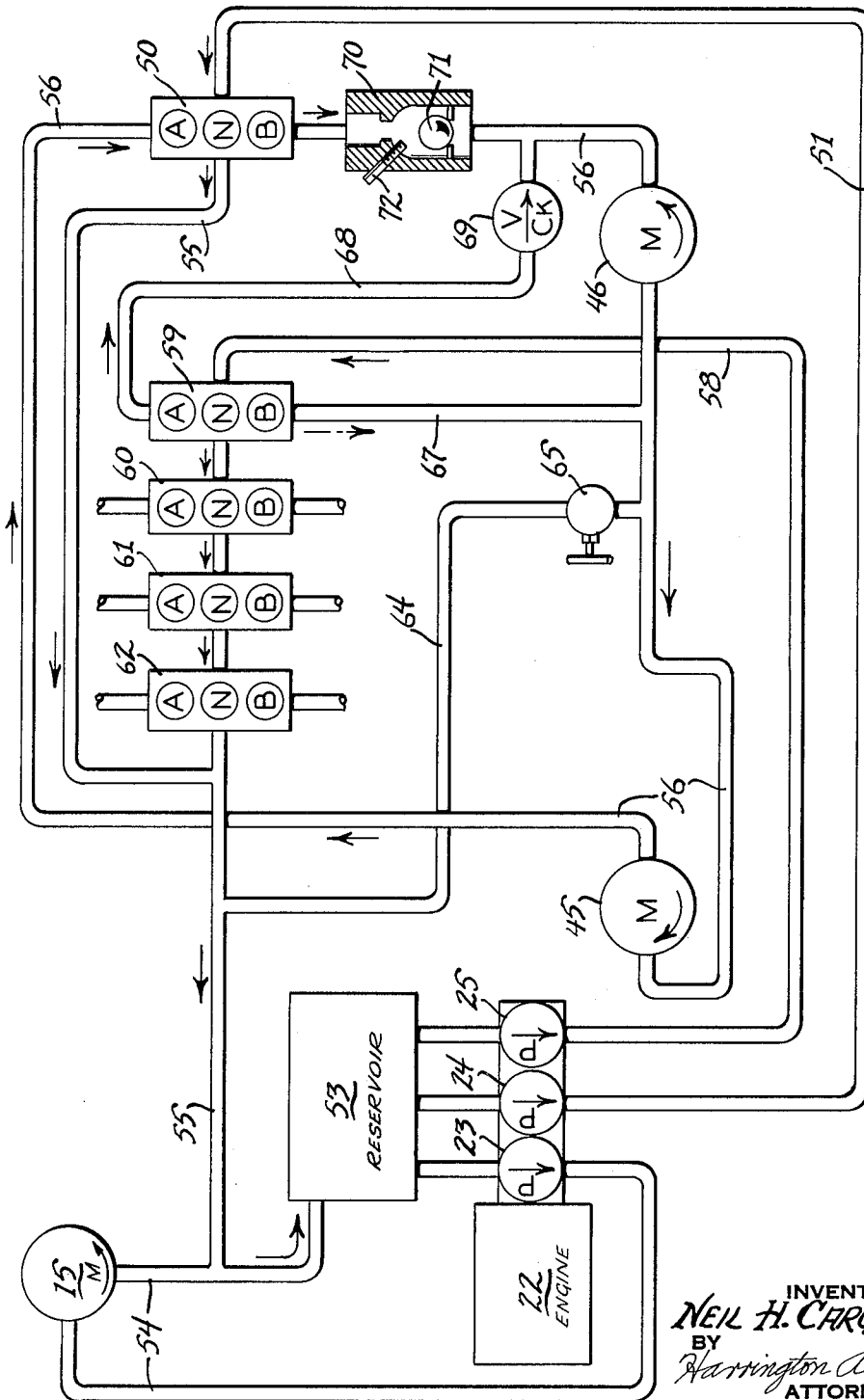
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HYDRAULIC DRIVE MEANS FOR DREDGE COMPRISING MEANS FOR THE SELECTIVE INJECTION OR WITHDRAWAL OF PRESSURE FLUID FROM A MOTOR DRIVING CIRCUIT

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14 Claims. (Cl. 37-67)

This invention relates to fluid control for a dredge, and more particularly to a system for controlling the swinging movement of the cutter head of a dredge.

One type of floating dredge now in widespread use incorporates a hull from the front end of which is suspended a ladder or ladder frame carrying a rotary cutter head. The ladder is adapted to be lowered into a body of water, such as a stream, until the cutter head engages the solid material to be excavated, such as the bed of the stream. The cutter head is then driven and moved laterally in order to cut a swath or strip of pre-determined thickness in the solid material. One method of laterally moving the cutter head is to anchor one rear corner of the hull to the stream bed and then swing the ladder frame about the anchored corner by means of swing lines or cables anchored on opposite sides of the dredge to the banks or bed of the stream. The swing lines are operated by winches, so that one line is winding while the other line is unwinding.

For various reasons, it has been difficult to obtain equal tensions in the swing lines during the swinging operation. One reason for the unequal tension in the cable during the swinging operation is that the pivot point of the dredge is at one corner and not on the center line of the hull. Another reason is that it would be an accident if the lines were anchored symmetrically about opposite sides of the dredge. Another cause of unequal cable tensions is the diameters of the outer coils about the winch are constantly changing as they are being wound and unwound. Thus, as the line is being unwound, the outer diameter is progressively decreasing, while the diameter of the coils of line winding on the opposite winch is progressively increasing. Thus, even if both winches were driven in opposite directions at a perfectly constant speed, the tensions in the lines would vary during the swinging operation. If the tension increased, undue strain would be placed upon the swing cables and the control mechanism; while if the tension decreased, unnecessary slack would be created in the cables permitting them to become tangled or kinked. Moreover, when swing lines become slack, a cutter head, which is rotating in the direction it is swinging, may overrun or "jump" out of its swath or cut. A run-away cutter head decreases the efficiency of the operation, since the cutter head has to be returned and the operation repeated, or a deeper cut must be made on the return swinging movement.

In order to overcome the problem of varying tension in swing lines, many dredges incorporate separately controlled mechanical brakes operating upon each of the winches. When too much tension develops in the lines, the winding drum is braked in order to permit the unwinding drum to catch up. In the event that too much slack is developed in the swing lines, then the unwinding drum is braked to permit the winding drum to catch up.

It is therefore an object of this invention to equalize the tension in the swing lines of a dredge by providing a novel fluid control system for the swing line winches, without the use of mechanical brakes.

Another object of this invention is to provide in a hydraulic swing circuit for controlling the swing line motors, a fluid control circuit for selectively varying the fluid pressure in the swing circuit in order to selectively vary the

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speeds of the swing line motors and consequently the winches.

Another object of this invention is to provide a novel system for selectively and independently varying the speeds of the hydraulic motors for the swing line winches by controlling the flow of fluid in the swing line circuit on opposite sides of one of the motors.

Another object of this invention is to provide a system for controlling the speed of the hydraulic winch motors in a dredge by selectively bleeding the swing line circuit between the motors.

A further object of this invention is to provide a system for controlling the speed of the hydraulic swing motors in a dredge by selectively increasing the fluid pressure in the swing circuit on one side of one of the motors.

Another object of this invention is to provide a novel means for selectively hydraulically braking, speeding up or slowing down the winch motors in a dredge.

Further objects of the invention will be apparent from the following description taken in conjunction with the drawings, wherein:

FIG. 1 is a side elevation of a conventional dredge, with parts broken away, which is adapted to be controlled by the invention;

FIG. 2 is a top plan view of the dredge disclosed in FIG. 1, with parts broken away;

FIG. 3 is a schematic flow diagram of the invention with the swing circuit operative to swing the cutter head in one direction; and

FIG. 4 is a view similar to FIG. 3 with the swing circuit operative to swing the cutter head in the opposite direction.

Referring now more particularly to the drawings, FIGS. 1 and 2 disclose a dredge 10 having a hull 11, control cabin 12, ladder frame 13 and cutter head 14. A hydraulic motor 15 is mounted on the outer end of the ladder frame 13 for driving the cutter head 14. The main engine 17 is mounted in the hull 11 to drive the dredge pump 18 which draws the solid material dug out by the cutter head 14 through the suction pipe 19 and discharges this material through the pipe 20. An auxiliary engine 22 is adapted to drive the various hydraulic pumps 23, 24 and 25, disclosed schematically in FIGS. 3 and 4.

A pair of spuds 27 and 28 is mounted on the left and right rear corners, respectively, of the stern of the hull 11. These spuds 27 and 28 are adapted to be alternately raised and lowered by means such as the cables 29, the hydraulic pump 25 and other mechanisms not shown, in order to anchor only one rear corner of the dredge at a time to the bottom of the body of the water to be dredged, such as a stream bed.

The ladder frame 13 is adapted to be raised and lowered by means of a cable 32 passing over a sheave supported on the boom 31 connected to the hull 11. The boom 31 is preferably in the form of an A-frame and is stabilized by means of the suspension cable 33 suspended from the gantry 34 extending above the stern of the hull 11. The cable 32 may be wound and unwound about a winch 35, which is driven by a hydraulic motor 36, optionally through a transmission 37 if desired.

The lateral movement of the ladder 13 and the cutter head 14 is obtained by manipulating the left swing line 39 and the right swing line 40. One end of each line 39 and 40 is anchored on opposite sides of the dredge 10 by any convenient means, such as by conventional anchors fixed in the stream bed, or by lashing or otherwise securing to any fixed object on the opposite banks of the stream. The swing lines 39 and 40 are threaded through sheaves 41 and 42, respectively, fixed to opposite sides of the forward portion of the ladder frame 13. The swing lines 39 and 40 then extend to the rear of the

ladder frame 13 and are wound around their respective winches 43 and 44 mounted in the hull 11. Each of these swing line winches 43 and 44 is driven respectively by the hydraulic motors 45 and 46 through their respective transmissions 47 and 48.

Most of the controls for the various operations of the dredge 10 are consolidated within the control panel 49 within the cabin 12, such as the control valve 50 which controls fluid distribution of the swing supply circuit 51 (FIGS. 3 and 4).

FIGS. 3 and 4 schematically disclose various fluid or hydraulic circuits for controlling the various hydraulic operations of the dredge 10. The single diesel auxiliary engine 22 is adapted to drive the three hydraulic pumps 23, 24 and 25 which are supplied with hydraulic fluid from a single storage tank 53. The pump 23 is adapted to supply fluid under pressure to the hydraulic motor 15 for driving the cutter head 14 through the circuit 54.

The pump 24 is adapted to supply hydraulic fluid under pressure through the swing supply circuit 51 to one side of the valve 50. The other side of the valve 50 communicates with the swing return circuit 55, which communicates with the other side of the fluid reservoir 53. The valve 50 also communicates with opposite ends of the swing circuit 56, which includes in series the hydraulic motors 45 and 46 for driving the swing line winches 43 and 44, respectively, in opposite directions.

The valve 50 is shown schematically and includes three operative positions A, N and B. These represent the three positions of the valve handle disclosed in FIG. 1. When the valve handle is in position N, or neutral, fluid communication is established between the supply line 51 and the return line 55, but both ends of the swing circuit 56 communicating with the valve 50 are closed in this position. When the valve handle is moved to position A, fluid communication is established in the valve 50 between supply line 51 and the left portion of swing circuit 56, while the return circuit 55 communicates with the right portion of swing circuit 56 through the valve 50, as disclosed by the arrows in FIG. 3. When the valve handle 50 is moved to position B, the supply circuit 51 communicates with the right portion of fluid circuit 56, and the return circuit 55 communicates with the left portion of swing circuit 56, as disclosed by the arrows in FIG. 4. Thus, it will readily be observed that when the valve 50 is in position N, or neutral, no fluid will flow through the swing circuit 56, the motors 45 and 46, and consequently the swing line winches 43 and 44, will remain idle, so that no swinging operation will occur. It will also be observed that when the valve 50 is moved to position A, fluid will flow through the swing circuit 56 in the direction of FIG. 3 to simultaneously wind the left swing line winch 43 and unwind the right swing line winch 44 in order to swing the cutter head 14 to the left of FIG. 2. When the valve 50 is moved from position A to position B, the fluid flow through swing line circuit 56 will be reversed to the direction of FIG. 4 to unwind the left swing line winch 43 and wind the right swing line winch 44 to swing the cutter head 14 to the right. Although the valve 50 is disclosed schematically in FIGS. 3 and 4, it may be of any conventional structure for establishing the above described fluid communication. There are many types of "spool" valves which will perform the function of valve 50, and a specific example which applicant has employed is a spool valve Model TBO7, disclosed in Catalog H-12, 1960, of the Commercial Shearing and Stamping Company.

Hydraulic pump 25 is adapted to supply fluid under pressure through the circuit 58 to a series of four valves 59, 60, 61 and 62, each of which functions substantially identically and may be of the same structure as the valve 50.

Valve 60 is adapted to control the operation of the right spud 28, while valve 62 is adapted to control the

operation of the left spud 27. The valve 61 is adapted to selectively reverse the supply of fluid under pressure to hydraulic motor 36 for raising and lowering the ladder frame 13.

The parts thus far described are substantially conventional in the art of dredging, except for the valve 59, the operation of which will be later described.

In order to control the relative speeds of the winch motors 45 and 46, a bleeder line or circuit 64, including a metering valve 65, such as a conventional gate or globe valve, connects the swing circuit 56 between the motors 45 and 46 with the return line 55, as disclosed in FIGS. 3 and 4.

In addition to the bleeder circuit 64, a control circuit including a branch line 67 and another branch line 68 connects the valve 59 with the swing circuit 56 on opposite sides of the motor 46. The branch line 68 is provided with a check valve 69 which permits free fluid flow from the valve 59 to the swing circuit 56 only, and completely blocks fluid flow in the reverse direction.

A variable flow check valve 70 is placed in the swing circuit 56 between the valve 50 and the junction of the line 68 with the swing circuit 56. The variable flow check valve 70 permits free fluid flow from the valve 50 into the right portion of the swing circuit 56, but permits only limited or controlled fluid flow in the reverse direction. Although any convenient type of variable flow check valve 70, which will perform the above functions, may be employed, a simple type of such a valve is shown schematically in section in FIGS. 3 and 4. The check valve 70 is provided with a ball 71, which is free to be moved toward the motor 46 by fluid pressure in that direction, but fluid flow in the reverse direction will partially seat the ball 71 against the adjustable set screw 72. The set screw 72 is preferably adjusted so that when the ball 71 is seated, as disclosed in FIG. 3, fluid flow in the direction of the arrows through the swing circuit 56 will be normal and unrestrained without developing any material back pressure when the control circuit valve 59 is in neutral.

The operation of the invention is as follows:

Assuming that the dredging operation is moving from right to left and the cutter head 14 has a counter-clockwise rotation, as viewed by the operator from the cabin 12, then the right spud 28 adjacent the discharge pipe 20 is anchored in the stream bed while the left spud 27 is maintained in a raised position. The operator then lowers the ladder 13 by means of the valve 61 until the cutter head 14 rests on the stream bed. The operator then shifts the swing valve 50 from its neutral position N to position A to direct the fluid from the supply line 51 through the swing circuit 56, in the direction of the arrows in FIG. 3, to drive the winch motors 45 and 46 in opposite directions for swinging the cutter head 14 to the left. However, due to the possible different rates of travel of the swing lines 39 and 40, for reasons heretofore mentioned, assume that excessive slack develops in the right swing line. In this situation, the right winch 44 is unwinding the right swing line 40 faster than the left winch 43 is winding the left swing line 39. This is a most undesirable situation for a cutter head 14 rotating in a counter-clockwise direction, since slack in the right cable or swing line 40 will permit the cutter head 14 to overrun or jump out of its swath or cut and roll across the bottom of the stream without actually digging.

One method, in accordance with this invention, of eliminating the above cable slack is to manually open the metering valve 65 in order to bleed off fluid from the swing circuit 56 between the motors 45 and 46. When the metering valve 65 is open, the motor 45 will continue to drive the winch 43 at substantially the same rate as before to continue winding up the left cable 39. But the motor 46 will slow down because part of its normal supply of fluid has been diverted into the bleeder circuit 64. Technically, the motor 45 will probably speed up slightly because the fluid being bled off the circuit 64 will reduce the back

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pressure slightly on the motor 45. Thus, with the speed of the motor 45 slightly increased and the speed of the motor 46 reduced to a degree depending upon the opening of the metering valve 65, there will be a slight increase in winding speed of the left cable 39, and a substantial decrease in the unwinding of the right cable 40 to eliminate the cable slack. The valve 65 may be carefully regulated to a point where the rates of winding and unwinding the lines 39 and 40 are substantially equal, and the valve 65 may remain set in this equalized position.

The bleeder circuit 64 will operate in the same manner to eliminate slack in the swing cables 39 and 40 when the dredging is reversed from left to right. In this case, valve 50 is shifted to position B and fluid flows through the swing circuit 56 in the direction of the arrows of FIG. 4 to drive the motors 45 and 46 to unwind the left cable 39 and wind the right cable 40. Assuming that the left motor 45 is driving too fast or the right motor 46 is driving too slow, then by opening the metering valve 65, fluid from the swing circuit 56 will bleed off through the circuit 64 to slow down the unwinding left winch 43, and possibly slightly increase the speed of the right winding winch 44.

In order to further control tension and slack in each of the cables 39 and 40, regardless of the direction of swinging, the control circuit 67-68 and the valves 59, 69 and 70 have been added to the swing circuit 56. Again assuming the cutter head 14 is rotating counter-clockwise and the swinging operation is from right to left (FIG. 3) with the winch motor 46 rotating too fast, creating slack in the right cable 40, the handle of the valve 59 is shifted to position "A" so that fluid under pressure from the supply circuit 58 is diverted to the branch line 68 through the check valve 69 and into the swing circuit 56. Although part of the pressurized fluid will flow through the controlled check valve 70, the major portion of the fluid will move against the normal flow of fluid in the swing circuit 56 to create back pressure and brake the motor 46, even to the point of completely stopping the motor. Simultaneously, with the valve 59 in position "A," the branch line 67 is connected to the return line 55 so that the discharge side of the motor 45 and the inlet side of the motor 46 are immediately in communication with the reduced pressure of the storage tank 53. Thus, with the great concentration of fluid pressure on the discharge side of the motor 46 and the substantial reduction in pressure in the swing circuit 56 between the motors 45 and 46, the speed of the motor 46 will be greatly reduced or stopped entirely, while the motor 45 will continue to drive the winding winch 43. The valve 59 may be held in position "A" until normal tension is restored, or if the cutter head 14 is giving considerable difficulty, until the right winch 44 is absolutely stopped.

Again, if the swinging operation is progressing from right to left and either the left winch 43 is winding too fast or the right winch 44 is unwinding too slow, or both, so that there is undue tension in the swing lines 39 and 40, the valve 59 is then shifted to position "B" and the pressurized fluid from supply line 58 will then communicate with the branch line 67, as shown by the dashed-line arrow (FIG. 3), and the branch line 68 will be connected with the return line 55. However, since the branch line 68 includes the check valve 69, any fluid flowing in the reverse direction, from the swing line 56 to the valve 59 will be cut off at the check valve 69. The fluid flowing through the line 67 will enter the swing circuit 56 and flow toward both motors 45 and 46. The result will be that back pressure will develop on the discharge side of the motor 45 to reduce its speed, and pressure will be increased on the inlet side of the motor 46 to drive it faster. Thus, the tension in both swing lines 39 and 40 will be relieved. The valve 59 may be returned to the neutral position "N" as soon as normal tension is restored in the swing lines 39 and 40. Although the control valve 70 may slightly retard the increased flow of fluid from the

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motor 46, still sufficient inlet pressure may be developed to drive the motor fast enough to unwind the cable 40 and eliminate the tension.

When the swinging operation of the dredge is reversed to move from left to right, there will usually be fewer difficulties because the cutter head 14 is rotating counter-clockwise, which is opposite to the direction of swinging, and therefore there will be no tendency to overrun the swath. However, the problem of undue tension or slack in the swing lines still exists regardless of the swinging direction.

When the dredge 10 is swinging to the right, the valve 50 has been shifted to position "B" so that pressurized fluid from the line 51 enters the swing circuit 56 in the direction of the arrows disclosed in FIG. 4 to reverse the directions of the motors 46 and 45 and consequently the winches 43 and 44. In this situation the right winch 44 is winding the swing cable 40, while the left winch 43 is unwinding the swing cable 39. When the winch 43 is unwinding too fast and slack develops in either or both the cables 39 and 40, the valve 59 is moved to position "A" so that fluid is introduced into the control circuit through the branch line 68, check valve 69 and into the swing circuit 56 to increase the fluid pressure entering the motor 46 and thereby increase the speed of the winch 44 to wind up the cable 40 faster and thereby eliminate the slack. With the valve 59 in position "A" the fluid in the swing circuit 56 between the motors 45 and 46 will exhaust through the branch line 67 and into the return line 55. This reduction of pressure will slightly reduce the back pressure on the motor 46 causing it to increase even faster, but will also reduce the pressure on the inlet side of the motor 45 so that the winch 43 will unwind the left cable 39 slower to further eliminate slack.

Assuming now that the dredging is still progressing from left to right, and undue tension develops in either or both the swing lines 39 or 40, then the valve 59 is moved to position "B" (FIG. 4) so that pressurized fluid from the supply circuit 58 is introduced into the branch line 67 of the control circuit, flowing in the direction of the dashed-line arrow. This fluid will be introduced into the swing circuit 56 between the motors 45 and 46, to slow down the motor 46 to decrease the winding speed of the right swing line 40. The pressurized fluid will also flow toward the motor 45 to increase the unwinding speed of the left swing line 39. Thus, tension is relieved to reduce the strain in both cables 39 and 40.

It will be understood that movement of the valve handle 59 to either position "A" or position "B" will generally subsist for only a matter of a few seconds, which will be ample time for normal tension to be restored in the cables. Of course, sometimes when the cutter head 14 has an overrunning tendency, the valves 59 may have to be manipulated repeatedly in order to create the necessary braking action on the trailing or unwinding swing line. If the cutter head 14 has a counter-clockwise rotation, then only the unwinding right cable 40 will have to be controlled for an overrunning condition. Although most cutter heads do have a counter-clockwise rotation, there are some cutter heads which are designed to have a clockwise rotation. In this event, all the lines described will be completely reversed, in order to carry out the same functions.

It will be further observed that this control system is designed only to brake the right motor 46 to a complete stop when the cutter head 14 has a counter-clockwise rotation. The left motor 45 does not need to be braked to a complete stop, but need only be driven faster or slower to carry out its intended function.

It has been found that this invention operates more effectively when the control circuit pump 25 has a capacity greater than the swing circuit pump 24, and preferably a capacity about 25%-50% greater. Thus, the capacity to deliver more pressurized fluid into the swing circuit 56 than is normally present, and particularly when the added

fluid flow opposes the swing circuit flow, creates an effective and immediately responsive swing motor control.

The advantages of a completely hydraulic control system which may be installed in an existing swing circuit are manifest. Not only may the existing hydraulic controls be implemented, but the use of mechanical brakes which are expensive and subject to constant and rapid wear may be eliminated.

It will be apparent to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof, and therefore the invention is not limited by that which is shown in the drawings and described in the specification, but only as indicated in the appended claims.

What is claimed is:

1. A fluid control system for a dredge having a left swing line winch and a right swing line winch comprising:
 - (a) a fluid swing circuit,
 - (b) a left fluid motor in said swing circuit for driving said left winch,
 - (c) a right fluid motor in series with said left fluid motor in said swing circuit for driving said right winch in the opposite direction from said left winch,
 - (d) means for supplying fluid under pressure to said swing circuit for driving said motors,
 - (e) means for reversing the flow of fluid through said swing circuit to reverse the directions of said motors,
 - (f) a control circuit including first and second branch circuits,
 - (g) said first branch circuit communicating with said swing circuit between said motors,
 - (h) said second branch circuit communicating with said swing circuit on the opposite side of one of said motors from said other motor,
 - (i) means for supplying fluid under pressure to said control circuit, and
 - (j) valve means for selectively diverting said supply fluid in said control circuit to said first branch circuit or to said second branch circuit.
2. The invention according to claim 1 further comprising a check valve in said second branch circuit to permit fluid flow only from said control circuit into said swing circuit, and a control check valve in said swing circuit on the opposite side of said second branch line from said one motor.
3. The invention according to claim 1 in which the dredge for which said control system is adapted includes a cutter head having a counter-clockwise rotation, and said one motor between said first and second branch circuits is said right fluid motor.
4. The invention according to claim 1 further comprising a bleeder circuit communicating with said swing circuit between said motors, and valve means in said bleeder circuit for bleeding varying amounts of fluid from said swing circuit in order to vary the relative speeds of said motors.
5. The invention according to claim 1 in which the pressure of the fluid supplied to said control circuit is substantially greater than the pressure of the fluid supplied to said swing circuit.
6. The invention according to claim 1 in which the fluid capacity of said control circuit is substantially greater than the fluid capacity of said swing circuit.
7. The invention according to claim 6 in which said control circuit capacity is 25-50% greater than said swing circuit capacity.
8. The invention according to claim 1 further comprising a check valve in said second branch circuit to permit fluid flow only from said control circuit into said swing circuit.
9. A fluid control system for a dredge having a left swing line winch and a right swing line winch comprising:
 - (a) a fluid swing circuit,
 - (b) a left fluid motor in said swing circuit for driving said left winch,

- (c) a right fluid motor in series with said left fluid motor in said swing circuit for driving said right winch in the opposite direction from said left winch,
- (d) first means for supplying fluid under pressure to said swing circuit for driving said motors,
- (e) a fluid control circuit communicating with said swing circuit between said motors,
- (f) second means for supplying more fluid under pressure through said control circuit to said swing circuit than is supplied by said first means to said swing circuit, and
- (g) valve means in said control circuit for selectively introducing fluid under pressure solely from said second means into said swing circuit.
10. The invention according to claim 9 in which said valve means comprises means for withdrawing fluid from said swing circuit through said control circuit.
11. A fluid control system for a dredge having a left swing line winch and a right swing line winch comprising:
 - (a) a fluid swing circuit,
 - (b) a left fluid motor in said swing circuit for driving said left winch,
 - (c) a right fluid motor in series with said left fluid motor in said swing circuit for driving said right winch in the opposite direction from said left winch,
 - (d) first means for supplying fluid under pressure to said swing circuit for driving said motors,
 - (e) a fluid control circuit communicating with said swing circuit on one side of one of said motors between said motors and on the opposite side of said one motor,
 - (f) second means for supplying fluid under pressure solely to said control circuit, and
 - (g) valve means in said control circuit for selectively introducing fluid under pressure solely from said second means into said swing circuit on the opposite sides of said one motor.
12. A fluid control system for a dredge having a left swing line winch and a right swing line winch comprising:
 - (a) a fluid swing circuit,
 - (b) a left fluid motor in said swing circuit for driving said left winch,
 - (c) a right fluid motor in series with said left fluid motor in said swing circuit for driving said right winch in the opposite direction from said left winch,
 - (d) first means for supplying fluid under pressure to said swing circuit for driving said motors,
 - (e) a fluid control circuit including first and second branch circuits,
 - (f) said first branch circuit communicating with said swing circuit on one side of one of said motors between said motors,
 - (g) said second branch circuit communicating with said swing circuit on the opposite side of said one motor,
 - (h) second means for supplying fluid under pressure solely to said control circuit, and
 - (i) valve means for selectively diverting fluid solely from said second supply means into said first branch circuit or said second branch circuit.
13. The invention according to claim 12 in which said second means for supplying fluid comprises a supply circuit and a return circuit, said valve means including a neutral position for communicating said supply circuit with said return circuit and closing said branch circuits, said valve means including a first operative position for communicating said supply circuit with said first branch circuit and said second branch circuit with said return circuit, and said valve means including a second operative position for communicating said supply circuit with said second branch circuit and said first branch circuit with said return circuit.
14. The invention according to claim 13 further comprising a check valve in said second branch circuit to

permit fluid flow only from said valve means into said swing circuit through said second branch circuit.

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